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Many men are built as cathedrals were built—the part nearest the ground finished, but that part which soars toward heaven, the turrets and the spires, forever incomplete.

—Henry Ward Beecher.

Work was made for man, and not man for work. Work is man's servant, both in its results to the worker and the world. Man is not work's servant, save as an almost universal perversion has made him such.

—J. G. Holland.

MONTHLY REVIEW

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American Electro-Platers' Society

Editors' Office, 236 Wellington Ave., S. E., Grand Rapids, Mich.

VOL. VIII AUGUST No. 8

EDITORIAL

H A S H.

A composition of many ingredients, including inert material to a more or less extent.

Comparable to some electro-plating and electro-cleaning solutions.

* * * * *

To Branch Secretaries.

For the benefit of the Editor, and incidentally the Branch Societies, the Editor would request Branch Secretaries to consider the three following suggestions, viz.,

To report immediately after Branch meetings.

To send to the Supreme Secretary all names of new members immediately after their election.

To eliminate all reference to Supply Houses, or their products by name. It would be highly improper to print such references at all.

* * * * *

On the proper page will be found an account of the naming of a general committee for the 1922 Convention. Good for Cinci. ! !

* * * * *

Chicago Branch have given the other branches a very high and difficult mark at which to shoot. It has been a pleasure to edit their question box. Thanks, Chicago!

* * * * *

Members, take notice! Criticism of our publication will be welcomed, coming from any member. This little Magazine is published for every member, not for any special group of members.

* * * * *

If the above isn't *hash*, what in'ell is it?

PRINCIPLES UNDERLYING THE ACIDITY OF NICKEL-PLATING SOLUTIONS

By W. Blum and M. R. Thompson

(Abstract of Address delivered to American Electro-Platers' Society, Indianapolis, July 2, 1921.)

All conducting solutions such as are used in electroplating, contain electrically charged ions. Those which are negatively charged, such as the chloride or sulphate ions (called anions), are carried by the current to the anode or positive pole. Those positively charged, such as the metal ions (called cations) are carried to the cathode or negative pole. The principal cations which are present in a simple nickel-plating solution, and which may be discharged at the cathode, are nickel ions and hydrogen ions. The nickel ions are derived from dissociation of the nickel salt, usually represented as follows:

$$NiSO_4 \rightleftharpoons Ni^{++} + SO_4^{--}$$

The hydrogen ions may be formed by the dissociation of any acid that is present, e. g., sulphuric acid, which dissociates as follows:

$$H_2SO_4 \rightleftharpoons 2\,H^{+} + SO_4^{--}$$

Other conditions being equal, the proportion of nickel and hydrogen that will be deposited by the current from a given nickel solution will depend upon the relative concentrations of the nickel and hydrogen ions. The metal cathode efficiency decreases as the acidity (or hydrogen ion concentration) increases. Not only the weight of the nickel deposited, but also its crystalline structure and physical properties (such as hardness, ductility, brightness, etc.), are related in some degree to the cathode efficiency and to the hydrogen ion concentration.

The strength of an acid is measured by the extent to which, when dissolved in water, it forms hydrogen ions. A strong acid, such as sulphuric or hydrochloric acid, is dissociated to a large extent, i. e. its solution contains a large number of hydrogen ions. A solution of a weak acid such as acetic acid (present in vinegar) contains less hydrogen ions; while even a saturated solution of a very weak acid such as boric acid contains a very small number of hydrogen ions. In considering the acidity of a solution it is necessary, therefore, to distinguish between (a) the *quantity of acid present,* and (b) the *degree of acidity;* just as we must distinguish between the quantity of heat contained in an object, and degree of heat i. e., the temperature of the object. In electro-

deposition the concentration of acid present in a solution is usually of much less importance than the degree of acidity or the "hydrogen ion concentration."

There are various methods of expressing numerically the hydrogen ion concentration of any solution, all of which are in terms of a normal solution, that is one which contains one equivalent weight (approximately one gram) of hydrogen ions per liter of solution. In such a solution we could call the hydrogen ion centration N; in a solution with one-tenth that concentration it would be 1/10 N, N/10 or 0.1 N, etc. In most nickel solutions we have only a small concentration of hydrogen ions, e. g., 1/10,000 N or N/10,000 or 0.0001 N. In order to avoid the use of a large number of figures, such values are frequently expressed in terms of logarithms, i. e., of the powers of 10. Thus 100 is 10^2; 1000 is 10^3; i. e., the logarithm of 100 is 2; of 1000 is 3, etc. In expressing fractions, the logarithm is designated as negative; thus 1/100 is $1/10^2$ or 10^{-2};1/1000 is $1/10^3$ or 10^{-3}, etc. In order to still further simplify the expression of hydrogen ion concentration, Sorensen proposed the use of the number or "exponent," without the negative sign; and designated this number as the "pH" of the solution. Thus if the hydrogen ion concentration is one hundredth normal, i. e. 1/100 N or $1/10^2$ N, or 10^{-2} N, the pH is 2. The relation between these different forms of expression is shown in the following comparison.

TABLE 1.

METHODS OF EXPRESSING HYDROGEN ION CONCENTRATION

Fraction	Decimal	Logarithm	pH
1/10	0.1	10^{-1}	1
1/100	0.01	10^{-2}	2
1/1000	0.001	10^{-3}	3
.....	.....	.....	..
1/1,000,000	0.000,001	10^{-6}	6
1/10,000,000	0.000,000,1	10^{-7}	7

It is important to note that in the pH system, the numbers increase as the hydrogen ion concentration decreases; thus a solution with a pH of 4 is *more* acid than one of 6. This may at first lead to some confusion, but it is no more difficult to master than the use of gauge numbers for sheet metal and wire, etc., in which a larger number indicates a smaller diameter or thickness.

Pure water contains a very small but equal number of both hydrogen ions and hydroxyl ions, formed by dissociation, thus

$$H_2O \rightleftharpoons H^+ + OH^-$$

Hydroxyl ions may also be derived from bases such as sodium hydroxide, thus

$$NaOH \rightleftharpoons Na^{+} + OH^{-}$$

The concentration of hydroxyl ions is a measure of the alkalinity of the solution. In all water solutions, the product of the concentration of hydrogen ions and hydroxyl ions is (at 25° C or 77° F) about 10^{-14}. In pure water each is equal to about 10^{-7}; therefore the pH of pure water or of a strictly neutral solution is 7.

Most accurate measurements of pH are made with a hydrogen electrode, which requires complicated apparatus, and moreover may not be applicable to nickel solutions. A much simpler method depends upon the use of appropriate indicators. An indicator is a dye, the color of which changes with the pH. The common use of indicators in titrating acids or bases dependens upon the fact that their color is different in acid and alkaline solutions and with a properly selected indicator if a neutral (or some specified) tint is obtained, the acid has been exactly neutralized by the base. The amount or concentration of the acid can then be calculated. The most common indicators used in acidimetty are methyl orange, litmus, and phenolphthalein, the characteristic colors of which are as follows:

TABLE 2.

COLORS OF INDICATORS

	Acid	Neutral	Alkaline
Methyl orange	pink	orange	yellow
Litmus	pink	purple	blue
Phenolphthalein	colorless	colorless	pink

Although these indicators are generally used to determine the *amount* of acid present, they may also be employed for measuring the pH or degree of acidity. Thus, if equal amounts of methyl orange are added to the four following solutions, the colors will be as stated.

TABLE 3.

RELATIVE pH OF ACIDS.

Acid	Concentration	Color with Methyl Orange	Approximate pH
Sulphuric	0.01 N	pink	2
Acetic	0.01 N	orange pink	3
Boric (saturated)	0.75 N	orange	4
Carbonic (saturated)	0.06 N	yellow	6

These colors indicate that in equivalent strength, acetic acid is much weaker, i. e., produces less hydrogen ions than does sulphuric acid; and that even more concentrated solutions of boric acid or carbonic acid have a much smaller acidity.

The terms "acid," "alkaline," or "neutral" are relative only, and it is therefore necessary to specify in each case the indicator used. Thus, e. g., if to three tubes of a normal solution of sodium bicarbonate, $NaHCO_3$, (containing a slight excess of carbonic acid and having a pH of about 7), the above three indicators are added, the results will be as follows:

TABLE 4.

REACTION OF $NaHCO_3$ SOLUTIONS

Indicator	Color	Common designation
Methyl orange	yellow	alkaline
Litmus	purple	neutral
Phenolphthalein	colorless	acid

Therefore, according to the indicator used, the same solution may be (as commonly expressed) acid, alkaline, or neutral.

Each indicator is most sensitive in a particular range of pH, therefore it is necessary to employ for any given purpose a suitable indicator. In the effort to secure high sensitivity, a large number of indicators have been studied by various investigators, and the most favorable ones have been selected. A list of such indicators, with their color charts, is published in a recent book by W. M. Clark upon the *Determination of Hydrogen Ions* (Williams and Wilkins, Baltimore), a book which should be in the hands of every chemist interested in problems of acidity.

For good nickel-plating solutions, the pH is almost certainly between 3 and 6.5; and may be within still narrower limits. There is no single indicator which covers this entire range satisfactorily. Methyl red is sensitive from about 4.0 to 6.0, and may prove useful, though its solutions are not very stable, and therefore it is not suitable for the preparation of permanent comparison standards[1]. Two less common indicators, brom phenol blue and brom cresol purple, have been used successfully in our research work to cover the above range of 3 to 6.5.

[1] In a paper presented to the Electro-platers' Convention at Indianapolis, by O. W. Storey, of the Burgess Laboratories at Madison, Wis., the use of methyl red for factory control of nickel solutions was recommended upon the basis of its successful application for eighteen months. No attempts were made, however, to measure the actual pH of the solutions.

To determine the approximate pH of a nickel-plating solution, all that is necessary is a few glass tubes, the appropriate indicator solutions, and, preferably, a few nickel solutions of known pH to serve as comparison standards. To a sample of the plating solution a few drops of the indicator is added, and the color is then compared with the standard nickel solutions containing the same amount of indicator. This comparison is facilitated by the use of a small wooden block with holes bored in it, as described by Clark. If standard nickel solutions are not available, the "drop method" as devised by L. J. Gillespie[2] and also described by Clark, may be used.

Further work is in progress to determine the relation between the pH of nickel solutions and the properties of the deposit. In a paper on the "Use of Fluorides in Solutions for Nickel Deposition" [3], it was shown that one important function of fluorides, is their effect on the regulation of the pH, through the so-called "buffer action." This may be defined as the formation of a potential reservoir of hydrogen ions through the presence of weak acids or their salts. In consequence the pH of a well-buffered solution does not change rapidly upon the addition of acid or alkali. This buffer action can be readily illustrated by adding dilute hydrochloric acid to two tubes, one containing very dilute alkali and the other about 0.5 N sodium phosphate; and both colored pink with phenolphthalein, i. e., both having about the same pH. It will be found that a very small amount of the acid will decolorize the first solution, while an appreciable amount will be needed for the phosphate. If now, methyl orange is added to each, the first tube will propably show an acid reaction to it or at most will require very little acid, while the second will be alkaline, and will require a very considerable additional amount of acid to turn it pink. In other words, a solution containing phosphates is well-buffered.

It is believed that the application of the above principles to both the study and operation of nickel-plating solutions will throw light upon many present problems, such as the curling, pitting, etc., of deposits. It is probable, however, that other factors beside the acidity of the solutions must be taken into account, such as the composition and structure of the anodes and their consequent effect upon the solution. Arrangements are now being made to have the use of indi-

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2) Journal Am. Chem. Soc. 42, 742 (1920).

3) W. Blum. Trans. Amer. Electrochem. Soc. 39, 227; 1921; and Chem. Met. Eng., 24, 1109, 1921.

cators tested out in a few commercial plants. As soon as any specific recommendations can be made for the control of the pH of nickel solutions, they will be published.

DISCUSSION.

Mr. Proctor: I ran one or two solutions on some very special work and we used citrates, and I think we had as white a nickel as has been produced.

Mr. Thompson: $NiSO_4 \rightleftharpoons Ni^{++} + SO_4^{--}$. That is what you get when you dissolve nickel sulphat in distilled water. For all practical purposes, so far as the plater is concerned, this combination occurs so rapidly, it will be something like this $Ni^{+}S^{+}O_4^{-}$.

Mr. Blum: I think, perhaps, there is a point of contention. All we mean to show when we say nickel sulphate dissociates—it means at any given time there is a certain proportion of nickel sulphate in the form of iron. If we had nickle sulphate one-tenth might be in the form of iron and nine-tenths might be in the form of nickel sulphate. That would be continually going on although it would never be the same tenth.

Mr. Thompson: Last winter one of the students of the St. Louis Institute came to me and asked me concerning the percentage of ionization.

Dr. Blum: The percentage of ionization increases with dilution, but the total number of ions in a given volume of solution decreases.

Mr. Thompson: The question came up of the conductivity of the solution over the concentrated solution. I experimented along that line and proved that the solution with 8 ounces of double nickel salt per gallon of water was only about 60% conductivity of the concentrated solution. I could not see how the percentage of ionization increases with the dilution.

Dr. Blum: The percentage increases. But that is perfectly consistent because the same volume of solution would have less ions although the greater proportion of the nickel would be in the form of ion. I think that is straight.

Mr. Thompson: $Ni^{++}SO_4^{--}$. Suppose we add an equivalent of sulphuric to a solution of nickel sulphate, what effect would it have on the rate of deposition? To get down to actual fact, what effect would it have on the outside charge of electricity affecting this charge.

Dr. Blum: You will increase the number of hydrogen ions in there and decrease the number of nickel ions.

Mr. Thompson: With an added quivalent of H^2SO^4 we would require just double the amount of current to get the same rate of deposit?

Dr. Blum: No, it would be a great deal different than that because with an equivalent of sulphuric acid in there you would not deposit any nickel.

Mr. Thompson: We would not deposit but we would have about the same reaction. Ni would be reacted upon and the reaction would be the same.

Mr. Fraine: I think that this Convention owes Dr. Blum a most hearty vote of thanks for the very able talk that he has given us today. I do no know when I have listened to a talk that has done me more good and from which I am going to get information that will be of great value to my concern and department. I feel that you, too, have obtained the same degree of information. I think that this may be regarded as a milestone of our Society. Ten years ago, we would not have been able to understand this talk. Next year we shall be even further advanced. We are progressing. A great deal of our progress has been due to the interest that has been taken in our Society by the Bureau of Standards through the efforts of our very valued friend, Dr. Blum, and I think this Convention owes Dr. Blum a most hearty vote of thanks.

"DADDY" HALE

By resolution of the Supreme Convention, a telegram of felicitations was sent to "Daddy" Hale of the Cleveland Branch. The following is a reply to the above:

Mr. John E. Sterling,
468 Grand Ave.,
Long Island City, N. Y.

Dear Sir:—

"Daddy" Hale desires to express his grateful appreciation of the very kind message he received from our associates of the American Electro-platers' Society. He regrets that he could not be with them at the Convention, and with a sincere desire in his heart for the welfare of each and every member, hopes to meet them next year at Cincinnati.

Faithfully yours,
EDWARD WHITE HALE.

83 Reilly St.,
Akron, Ohio,
July 3, 1921.

MAKING A NICKEL SOLUTION FOR ELECTRO-PLATING ZINC SHEET AND DIE CASTINGS HIGH IN ZINC

By E. S. THOMPSON (Chicago Branch).

We have read many formulæ for solutions for plating the troublesome metal mentioned in the heading of this paper. The writer, in a previous paper published in *The Brass World* several years ago, gave a solution which worked on base given in the paper. The instructions were to use *four volts,* with about five minutes time. Later, a plater from some point in West Virginia went before the Cleveland Branch of the A. E. S., and condemned the solution, and the author as a fake. The truth is, the plater did not understand the importance of volts, amperes, and time. It is well known that four volts in the nickel solutions with low or medium concentration, will "burn" if the deposit is continued for more than a few minutes. This phenomenon does not so readily take place on zinc because of difference of potential (D. P.) between te nickel anode and zinc cathode in the ordinary nickel solution and the discharging potential zinc sulphate or zinc chloride, as the case may be, in the nickel solution. The meaning of the above terms, or values, will be made plain to the layman as we proceed.

Before going further into this I wish to call attention to Mr. G. B. Hogaboom's able talk before the Indianapolis Convention June 30th, 1921, evening session, when he referred to unknown gases being liberated by the electric current, and the failure of the electrolyte to obey the *chemical laws* while in operation. Mr. Hogaboom has called for a symposium in the American Electro-Chemical Society for the investigation of elements set free by the electric current. Mr. Hogaboom has come to appreciate the value of Physics and Metallurgy as well as Analytic Chemistry in the electroplating field. Of the latter, the writer will assert that it is of value only as the first steps in electro-chemistry and for the determination of final results.

In making up a nickel solution for depositing upon zinc we determined the P. D. between nickel and zinc in the double salt solution without additional agents, the straight sulphate solution and a solution of sodium chloride. At several different concentrations of these solutions the P. D. was the same—i.e., about 0.8 volt. The P. D. between nickel and steel in these same solutions was about 0.2 volt. Then, if there were no other factors entered, we would expect to deposit nickel at a voltage equal to the P. D. of nickel and

zinc, plus the discharging potential of nickel from such a solution. (Since the P. D. of nickel and zinc was the same in solutions of all the salts given, it was expected that the P. D. of those two metals would still be the same in a mixture of the salts in any proportion, which was found to be true, namely 0.8 volt.) Now, if the P. D. is 0.8 volt and the discharging potential of nickel from a certain solution is 1.4 volts (which was found to be true), then we would expect to obtain a satisfactory deposit upon zinc at a voltage slightly in excess of the sum of the two voltages (0.8 volt +1.4 volt)=2.2 volts. Repeated trials with certain concentrations of a solution with the salts mentioned, proved that it required about 4.6 volts to insure a nickel deposit which did not show "streaks," due to the counter e. m. f. of the zinc. This, for a day or two, seemed to bar us from obtaining a nickel deposit upon zinc at a voltage which could be steadily maintained for a given time, (in solutions of medium concentration, it being known that solutions of great metallic content would not "burn" at 5 volts. But as these deposits were brittle, they could not be used). But upon looking into the *electro*-chemical reaction, we find that we have $S O_4$ and Cl released upon the cathode, the molecules at the anode giving up an equivalent of the acids upon the decomposition of the first molecule and the *last* molecule (that next the cathode) releasing a radical compound or element. This is consistent with the writer's previous contentions that there is no movement of the molecules influenced by the electric current, and that the current travels from molecule to molecule, these elements or compounds which do not attract the charge (such as $S O_3$ or Cl) migrating toward the anode. Viewing it from this angle (which seems to be the only logical one) we would have, upon the cathode, $S O_4$ under certain conditions, and Cl when a chloride was used in the solution. $S O_4$ is not a compound which could exist in a nickel solution. It would instantly form $H_2 S O_4$ by reacting with the water unless an element were present for which the $S O_4$ had a greater affinity than it has for hydrogen. This element is present as metallic zinc. Then, we would have to contend with zinc sulphate, or at least prevent its formation by using a voltage of sufficient strength to overcome the e. m. f. set up by the action of Zn and $S O_4$ before we could expect to deposit nickel. As some authorities give the decomposition voltage as low as 2.35 volts (while others give it as 2.54 volts), we will *suppose* that the decomposition voltage of 2.35 volts for $Zn S O_4$ is correct and see what happens. As the P. D. between Ni and

Zn is 0.8 volt and the discharging potential of Ni from SO_4 is 1.4 volts and the discharging potential of Zn SO_4 is 2.35 volts, we will see that it would be necessary to employ a voltage in excess of the *sum* of these voltages before we could expect to deposit nickel upon zinc. This sum (0.8+ 1.4+2.35) equals 4.55 volts. Then we could not expect to deposit nickel upon zinc at less than 4.6 volts, which was found to hold true in most solutions which were neutral or slightly acid. Depositing at such a voltage is unsatisfactory for the reason that when the edges of the zinc or die casting are thoroughly coated with nickel (which conditions comes about before the center of the sheet is coated in like manner) it no longer forms Zn SO_4, nor does it have the P. D. of 0.8 volts previously mentioned, and consequently the deposit is roughened or made brittle by "burning," the limit of voltage allowed in such solutions (2 volts) being far exceeded.

It is apparent, then, that the total counter e. m. f. must be reduced before we can hope to deposit nickel upon zinc at low voltages. Since the P. D. between Ni and Zn is only 0.8 volt, the writer ignored that P. D. and exerted his energies toward the prevention of the formation of Zn SO_4 or, at least, the formation of SO_4 upon the cathode. Believing, as we expressed in former papers of several years ago, that oxygen was forced out of Ni SO_4 at the anode, and that the final molecule at the cathode had the formula SO_3, and that SO_3 is *not* an active compound upon the zinc cathode, we succeeded in compounding a solution which brought about the result desired and Zn was electro-plated with nickel at the D. P. of nickel and zinc (–0.8 volt) plus the decomposition voltage of nickel (1.4 volt) =2.2 volts. This voltage was employed for a period of twenty minutes when it showed signs of over-voltage or "burning" at the corners and was removed. However, upon attempting to deposit nickel upon large zinc sheets in the shop, it was found necessary to employ 2.5 volts, due to the variations in the distribution of the electric current. These variations were in the length and size of the anodes, the proportional surface of anode to cathode and the resistance due to corroded hooks and rods. But since we succeeded in reducing the voltage necessary to the deposit of Ni upon Zn to that almost within the limits of steel, we can be assured that if it can be done in the laboratory it can be done in the shop by paying close attention to details.

E. S. THOMPSON.

CHICAGO QUESTION BOX

Question 1. How can carbon disulphide be removed from a silver solution when too much has been added as a brightener?

Answer. It was suggested steel plates be used as cathodes and solution worked until carbon is removed, then use plates for anodes until silver has been recovered.

Question 2. In mixing pitch and asphalt for tank lining, will they mix properly?

Answer. It was thought, backed by practical experience, that 15% of asphalt could be added to pitch without brittling it, even proportions as high as 40% asphalt will work if mixture is kept hot until poured.

Question 3. With what metal content and free cyanide does bright silver solution do the best work?

Answer. It was suggested that 3 to 3½ oz. of silver is about correct. Cyanide content to be governed by class of work; with hollow ware cyanide content should be quite high, to throw into deep recesses and hollows, but on flat ware content should be low to prevent burning or blistering. Operator should be able to judge as to quantity needed.

Question 4. What action will oxide of lime have in electric cleaner, and what chemical reaction with sodium carbonate and sodium hydroxide?

Answer. Additions of lime will make solution caustic, and chemical action, when lime is added to working cleaner was thought to regenerate the caustics in the solution, giving higher free caustic content.

Question 5. Is cadmium a good protective metal to prevent corrossion on steel previous to nickel plating?

Answer. It is about as non-corrosive as zinc, more expensive, and can be nickeled in the same manner.

Question 6. How much time is saved with a rapid nickel solution, how much if agitated, and how much if heated?

Answer. It was thought that in a heated and agitated solution the rapidity of deposition would be 100% faster than in a cold still solution.

Question 7. What is a good black for case-hardened Bessemer wire, that will not rub off after oiling?

Answer. It was thought the phosphoric black, consisting of 4 oz. phosphoric acid, 6 oz. phosphate of iron, one

gallon of water; boiling water first, then adding the acid, then the iron, then the work. It gave good results when boiled from three to four hours. Work with scale usually added to efficiency of process as the phosphoric acid seemed to dissolve the scale which in turn acted as a toning salt for the solution.

Question 8. Would like a solution for lead plating brass castings, also steel bolts and nuts, in plating barrel.

Answer. It was stated that this is being done successfully with a fluo-borate lead solution.

Question 9. What is the method of depositing cadmium on steel and then heating in an oven?

Answer. The work is plated in a cadmium solution for 1½ to 2 minutes, then put in an oven and heated to a temperature as high as 750 degrees Fahrenheit, which causes the cadmium to penetrate the pores of the steel and form a rust-proof coating. The work is then buffed and nickel plated in the usual manner.

Question 10. What causes die or zinc castings to cloud when buffed?

Answer. It is caused by getting work too hot when buffing, or by not using enough buffing composition.

Question 11. What causes zinc to precipitate on the anodes in a brass solution?

Answer. Lack of free cyanide.

Question 12. What will cause silver to deposit on steel, iron, carbon and silver anodes in a silver strike which contains .33 oz. silver and 12 oz. free cyanide per gallon?

Answer. It is caused by undissolved gases which will, when the current is shut off, generate a current that will flow in the opposite direction, and deposit the metal out of the solution on the anodes.

Question 13. What is the lowest initial voltage at which alloys high in zinc can be nickel plated?

Answer. Two volts.

Question 14. When steel is copper plated and then nickel plated, does it tarnish quicker than straight nickel plated steel when subjected to heat?

Answer. It is thought that straight nickel plated steel will tarnish quicker than when first copper plated.

"I had rather have a fool to make me merry than experience to make me sad."—Shakespeare.

"Good humor is said to be one of the very best articles of dress one can wear in society."—Thackeray.

OUR CONSTITUTION.

By request of the Secretary, Mr. Sterling, we will print a few extracts from our Constitution that are of importance to every Branch, especially of importance to every Branch officer.

We cannot sufficiently emphasize the importance of close observance of Article XI, section 1. It is mentioned on the Editorial page in the second suggestion to Branch Secretaries.

PART I—SUPREME SOCIETY.

ARTICLE 10.

Section 3 to read: The papers read before the Supreme Society or any Branch Society shall be published in the Monthly Review. They shall be released for publication ten (10) days after the day the Monthly is issued providing due credit is givin the Monthly Review by the publication printing the Articles. The Society, however, reserves the rights of discussion to any article or paper.

ARTICLE 11.

DUTIES OF BRANCH SOCIETIES.

Sec. 1. Each Branch Society must send the names of all applicants for membership to the Supreme Secretary, who shall direct the publication of same in the Monthly Review, and no application shall be acted upon until ten (10) days after such publication.

PART II—BRANCH SOCIETIES.

ARTICLE 2.

MEMBERSHIP.

Sec. 1. The membership shall consist of three (3) classes, to be called respectively: Active, Associate and Honorary.

Sec. 2. **Active Members.**—These shall consist of foreman electro-platers, and the applicant shall be required to furnish proof that he has been actively engaged in electro-plating for at least five (5) years, one (1) year of which he must have acted in the capacity of a foreman plater, and he shall also be required to pass such examination in the deposition of metals as may be deemed advisable by the Branch.

Sec. 3. **Associate Members.**—These shall consist of graduate chemists or electro-chemists, or those who have been actively engaged in electro-chemical engineering for a period of three (3) years, and representatives of supply houses dealing directly in electro-platers' supplies. Any supply house representative must qualify as an active member to be eligible. Associate members shall have all the privileges of active members except being eligible to any office other than a member of the Board of Managers.

Sec. 4. **Honorary Members.**—These shall consist of any persons whose knowledge or services would be or have been pre-eminently valuable to the Society.

Sec. 5. **Active and Associate Membership.**—Any applicant having qualified for membership under the above classifications will be automatically deprived of all rights and privileges under the old classification and entitled to all rights and privileges under the new classification when changing from one classification to the other.

WHAT THE BRANCHES ARE DOING

Cincinnati.

The regular meeting of Cincinnati Branch was held on August 19 and was very well attended. After regular routine business was finished, there was a short discussion on the use of sodium fluoride in nickel solutions which will be further discussed at the next regular meeting.

The 1922 Convention was taken up and several spoke of what is being done, or will be done to make it a pleasant occasion for all.

Cincinnati will be pleased to meet all members and friends next June for a jolly good time as well as an educational meeting.

JULY MEETING.

The Cincinnati Branch held its regular meeting on July 15th with a very good attendance, and all were well pleased to know that the next Convention will be held in our own Queen City.

A preliminary committee, known as the Convention Committee, was named as follows: Mr. Thomas Buchanan, Mr. Thomas Whitehead, Mr. C. Vance, Mr. F. Brumner.

An early start is desired in order to make the task of entertainment easier, realizing that it will be no easy matter to entertain the large crowd that is expected to be present.

Chicago Branch.

Regular meeting held August 13 with Vice-President Bott presiding, and with a fair attendance. It was reported that our Secretary-Treasurer, Mr. Hanlon, who has been ill for some time, had been taken to the hospital and would undergo an operation for appendicitis Monday morning. Mr. Hanlon has the best wishes of Chicago Branch for a speedy recovery.

Mr. Servis made a lengthy report of the Convention which was received with much interest. Among other things he stated that from an educational standpoint the Convention surpassed all preceding ones and was very successful in every way.

Two applicants were elected to membership and two more applications were received.

Bridgeport

The regular meeting for July was held on July 15th in the Laboratory with 11 members present, President J. W. Slattery presiding.

Mr. George B. Hogaboom gave a most complete and thorough report of the Convention, which was accorded a vote of thanks, after which the meeting was adjourned.

Our August, 1921, meeting was held in the Laboratory with twelve members present, President J. W. Slattery in the chair.

A motion was regularly made that the chair appoint a committee of five to make arrangements for a clam-bake to be held on September 9, 1921, if possible. The Messrs. Stratton, Flaherty, Dunn, Oberender and Rice were appointed as the Clam-bake Committee.

It was voted that the Secretary be instructed to keep $100 in a checking account, and the balance of the money to be deposited in a savings account, to draw interest. Mr. Oberender was welcomed back from Chicago, and gave a short talk on the doings in the West. The meeting adjourned at 9 P. M.

Milwaukee

The August meeting of the Milwaukee Branch was held August 5th at the West Side Bank Building. President Armour being absent, Vice-President J. S. Guttman opened the meeting. The attendance was unusually large. One application for membership was received.

The report of the Convention delegates was received with great interest. Mr. Frank Kakatsch gave a full report of everything of interest, and said that he would not miss another Convention.

We had as visitors Mr. E. Willmore and Mr. Henry of the Chicago Branch, both of them taking an active part in the discussions when the question box was opened.

The Picnic

The Milwaukee Branch held their annual picnic on Sunday, August 7th, at Bernlein Grove, Grafton, Wis. Thirty members, with their families, were present. Mr. Willmore and Mr. Henry stayed over the week-end in order to attend.

All seemed to have en enjoyable time. There were games for ladies and children as well as for the men.

The weather was ideal. After the games and races, the remainder of the day was spent in dancing and singing.

Mr. R. Hazucha, H. Willmore, Dan Wittig and Mr. Gutzoll as a quartette, rendered several fine vocal selections.

Philadelphia

Our August 5th meeting was marked by a fairly good attendance, President George Gehling in the chair.

After the regular routine business had been transacted, Mr. Kaufman gave an interesting talk on the Farraday Law; at the conclusion of his talk Mr. Kaufman was given a vote of thanks.

The President appointed a committee to arrange for a banquet to be held the last of November.

The delegate to the Convention made a detailed report of Convention doings, and spoke highly of the educational features and good spirit shown.

Indianapolis Branch.

The Branch held its regular meeting August 13. President Hennessey presiding, with a fairly good attendance.

As there has been a lull in the educational feature of our meetings since the Convention, it was decided that as cooler weather is coming, we stir up something for our future meetings.

We were pleased to have our Kokomo member (Mr. Boyd) with us who reported business as being fairly good in his city.

The main topic of the evening was our picnic held recently and from the drift of the talk it must have done a world of good for our Branch.

Picnic

Sunday, July 31st, the Indianapolis Branch gave a basket picnic for the members and their families at Walnut Grove, on Sugar Creek, twenty-one miles from the city.

It proved a delightful day for everyone; there was a cool breeze all day. (Absolute impossibility at Indianapolis—Editor).

Thanks are due to the ladies, and especially to Mrs. Harry Maze, who had charge of the arrangements and saw to it that there were no dull moments.

The pleasures of the day were varied; Mertz and Hal Warner went fishing but did not get any fish; bathing was very popular. Mrs. Hennesy could not get Richard near the water; Miss Lamoreaux shot the chutes (some splash); Ben Aufderheide's little girl can surely swim some.

After a good dinner, during which Hennessy spilled the beans and dry beer on Hoffman, we retired to the ball-grounds, and it surely was a treat to see those ladies play ball. "Babe Ruth" is a piker compared to Mrs. J. Walsh; she excells in batting, rooting, and base-running is her prize

effort. Mrs. Ormsby and Aufderheide complain of the size of the bat; they will be supplied with tennis racquets next time. The game was won by the "Stiff Knees." Score, 7 to 1.

A melon eating contest was next, with F. M. McDonald first and John Vehling as runner-up.

After the sports were finished, we departed for home, well satisfied with a good day well spent.

New York

President Stremel presided at the July 22nd meeting of the New York Branch. One application was received and referred to the Board of Managers.

The following plating problems were discussed:

(1) What black nickel solution is good for barrel plating? The solution in use is as follows:

8 oz. double nickel salts,
2 oz. sulpho-cyanide,
1 oz. zinc sulphate.
1 gal. water.

Mr. J. Haas suggested adding 4 oz. sodium sulphate to each gallon of solution.

(2) What brass solution is best for die castings?

After discussion is was decided that any good brass solution would do satisfactory work.

(3) What is the best way to overcome spotting out on gold-plated antimonial lead?

Sand buff and nickel-plate instead of cyanide copper-plate.

(4) What is a good formula for bronze finish on brass-plated antimonial lead?

1 oz. permangate of potash.
2 oz. chlorate of potash.
1 gal. of water.
Use hot.

Another formula for brass-plated articles:—

Dip in a solution of potassium or sodium sulphide, then in a strong solution of copper sulphate, repeat two or three times, until the required shade is obtained.

TIMES CHANGE.

"We see they have operated on a Chicago boy's head to make a better boy of him."

"That isn't where our dad used to operate on us to make a better boy of us."

St. Louis

Our Outing to be held on August 6 has been postponed until August 27. Swimming was on the program after we reached Belleville, Ill., but not before leaving St. Louis, so the date was changed, hoping for more favorable weather.

No regular meeting was held this month. However, one application for membership was received by the Secretary. (Evidently, St. Louis was "wet."—Editor).

Grand Rapids

Our regular monthly meeting was held August 10 at the Y. M. C. A. Building instead of the Vocational school, President Whalley presiding.

After the transaction of routine business Mr. Allen tendered his resignation as Secretary-Treasurer, due to heavy responsibilities placed upon him by his recent appointment as Editor of *The Monthly Review.* Mr. Jay A. Warner was elected to fill the office for the remainder of the year.

Librarian Poe then took the chair. The question arose as to the deposition of nickel upon die castings, which were answered by Mr. Poe and Mr. McMeekin.

Mr. Warner was called upon for information in regard to plating nickel upon a zinc deposit. Many questions were asked and the question well discussed.

Mr. Dykman asked as to the possibility or practibility of reclaiming slacked or powdered nickel coloring composition.

Mr. Allen gave an interesting talk on the composition of different coloring compounds and how best to bring them back to a usable condition after having been exposed too long to the air.

Connecticut Valley

A regular meeting of Connecticut Valley Branch was held on August 9 at the Veeder Manufacturing Co. Plant. Meeting called to order at 8: 30 p. m. E. N. Miller presiding on account of the absence of President Jas. A. Bagshaw. After the regular business was finished Mr. Geo. H. Cartlidge, a member of the Society, gave us a very interesting talk on spotting out of metals after plating. At the conclusion of his talk we adjourned to meet again on Sept. 14.

"I can't understand how men can put those nasty pipes and cigarettes to their lips," she mourned, and then bent to kiss the little bundle of life in her lap. And the poodle dog, sympathizing, snuggled closer against its mistresses' swan-like neck and wagged its little tail.

Pittsburgh

The regular meeting of August 6th was held with President Elliot S. Corbit in the chair. The attendance was small on account of a very severe thunder- and rain-storm, which broke over the city about 7: 30 p. m.

The delegates to the annual Convention, held at Indianapolis, told of the doings there and proved very interesting. Two new members were elected, one active and one associate. After the business had been disposed of, we were invited to take a tour of inspection of the Bureau of Mines Building, which all enjoyed. All manner of tests are made at the Bureau, and in the Museum the exhibit is wonderful; it has to be seen to be fully appreciated.

Toronto

The July meeting of the Toronto Branch was held on the 14th with the normal attendance. President William H. Cresswell presided.

After the regular order of business, reports of the delegate to the Convention, and also the other attending members, were received.

The delegate, Mr. James Vallier, gave a report that was listened to with close attention and was very well received.

Mr. F. H. Thiers gave a brief talk on the remarkable way the business was transacted.

Mr. Walter S. Barrows stated that he thoroughly enjoyed himself. He gave great credit to the committees for the way they conducted their business, and to the ladies for their interest in the welfare and pleasure of their visitors.

Great credit was given General Chairman B. D. Aufderheide who was punctuality and efficiency combined. Nothing was wanting, everything was in proper order, and the whole program was carried out in a most businesslike manner.

Mr. Barrows remarked that the Conventioned differed from previous ones; a more unselfish and hospitable atmosphere prevailed, an illustration of which was the repayment of one-third of the registration fee, which was the concluding act of a successful Convention.

CONVENTION EXPENSE

Disbursements

Printing Programs	$ 595.22	
Postage	40.75	
Stationery and Printing	67.01	
Badges	210.48	
Picnic Expense	329.40	
Autos for Sight-seeing Trip	36.50	
Educational Committee Expense	82.91	
Banquet	667.00	
Ladies' Committee	83.34	
Hotel Expense	37.50	
Miscellaneous Expenses	13.40	
Registration Refund	373.00	
		$2,536.51
Balance		115.49
		$2,652.00

Receipts

Advertising in Programs	$1,520.00	
Registrations	1,077.00	
Exhibits	55.00	
		$2,652.00

Convention Committee,
By B. D. AUFDERHEIDE.

NEW MEMBERS

New York

F. N. Mentz.....152 John St., Ilion, New York
J. Kruta .....410 E. 163rd St., New York City

Pittsburgh

C. V. Stewart, (Associate).....945 Ramsey Ave., Wilkinsburg, Pa.
A. J. DeSeve.....2226 Herronbone St., Youngstown, Ohio

Connecticut Valley

Wm. H. Stoddard (Associate).....48 Baltimore St., Hartford, Conn.

ADDRESS CHANGES

Bridgeport

G. Belle (new address).....2355 Fairfield Ave., Bridgeport, Conn.
A. M. Parsons (new address).....116 Byrnside Ave., Waterbury, Conn.

Rochester

R. P. Lopez (new address).....48 Karnes St., Rochester, N. Y.
Emil Troxler (new address).....385 Linden St., Rochester, N. Y.

APPLICATIONS FOR MEMBERSHIP

St. Louis

Wm. Pflueger (active).....4130 Clay Ave., St. Louis, Mo.

TRANSFERS GRANTED

From Chicago

W. C. Coleman.....Transferred to Grand Rapids
H. E. Jaeger.....Transferred to Milwaukee

BRANCH DIRECTORY

BOSTON

Meets first and third Fridays of each month, at 8 p. m., at the Quincy House. Secretary, A. W. Garrett, 37 Dorset Ave., Dorchester, Mass.

BRIDGEPORT

Meets third Friday of each month in its laboratory, 260 John St., Bridgeport, Conn. Secretary, L. J. Maraffi, 744 Hancock Ave., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., at the Briggs House, Randolph and Wells Sts. Secretary, F. J. Hanlon, 2855 N. Richmond St., Chicago, Ill.

CINCINNATI

Meets on the first and third Friday of each month, at 1262 State Ave. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets every second and last Saturday of the month at 1344 E. Prospect St. Secretary, B. F. McCormick, 1941 West 77th St., Cleveland, Ohio.

CONNECTICUT VALLEY

Meets at Hartford, Conn. Secretary, G. E. Vibberts, 31 Crown St., Hartford, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, C. Van Derau, 61 Bish Ave. Dayton, Ohio.

DETROIT

Meets first Friday of each month at Cass Technical High School, Platers' Classroom, 2nd Ave. and Beech St., at 8 p. m. Secretary, O. H. Phelps, 951 Clay Ave., Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., NE. Secretary, J. Andrew Warner, 738 Fairview Ave., N. E., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1728 Union St., Indianapolis, Ind.

MILWAUKEE

Meets first Friday of each month at the West Side Bank Bldg. Secretary, R. Steuernagel, 1508 Concordia Ave., Milwaukee, Wis.

MONTREAL

Secretary. A. Geroux, 48 Craig West, Montreal, Quebec, Canada.

NEWARK

Meets first, third and fifth Fridays of each month at Forresters' Home, 20 Central Ave., Newark, N. J., at 8 p m Secretary, O. F. Carlson, 225 West Grand St., Rahway, N. J

NEW YORK

Meets second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York City. Secretary, E. Haas, 504 East 163rd St., New York, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 26 Custom House St., Room 16. Secretary, C. J. Poyton, 269 Ohio Ave., Providence, R. I.

READING

Secretary, C. H. Bingham, 127 Greenwich St., Reading, Pa. (New Secretary not yet elected.)

ROCHESTER

Meets every second and fourth Friday of each month, at Hotel Seneca. Secretary, E. E. Fitch Jr., 607 Sawyer St., Rochester, N. Y.

SYRACUSE

Secretary, M. J. Crean, 109 Court St., Syracuse N. Y.

ST. LOUIS

Meets first Saturday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, H. H. Williams, 4156 Botanical Ave., St. Louis, Mo.

TOLEDO

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, H. L. Myers, 410 Palmer, Toledo, Ohio.

TORONTO

Meets second Thursday of each month at Occident Hall, Bathurst and Queen Sts. Secretary, C. Kemish, 671 Boston Ave., Toronto, Ontario, Canada.

WATERBURY

Secretary, Wm. Delage, 47 Prospect St., Waterbury, Conn.